

violence, and temperatures uniformly below the normal. Frosts occurred on the 26-27th in some of the northern sections and snow flurries were reported in some of the mountain regions of New Hampshire. High winds prevailed along the coast on the 18th and 19th, for which warnings were issued. There was no damage to shipping, so far as known to this office. No storms occurred without warnings.—*J. W. Smith, District Forecaster.*

#### NEW ORLEANS FORECAST DISTRICT.

The month of July was mild and no extensive storm occurred. The month opened with rainy weather in some parts of the district, especially over Texas, and showers continued until the 9th, after which dry weather prevailed, except for occasional scattered showers, until the 25th, when rainy weather set in over Louisiana and Texas and continued until the close of the month. The commencement of these rains, following two weeks' dry weather, was announced in the forecasts of the 24th, practically twenty-four hours before the rains set in. Excessive local rains occurred in Texas on the 29th and 30th.—*I. W. Cline, District Forecaster.*

#### CHICAGO FORECAST DISTRICT.

Except for squalls, which usually attend summer thunderstorms, there was but one storm of any severity which crossed the district during the month. This storm developed in the Southwest during the night of the 16th and passed across the Lakes during the 17th and 18th, causing destructive winds and doing damage. Warnings were issued well in advance and shipping interests cautioned. During the passage of this disturbance severe local storms with tornadic characteristics occurred in portions of Illinois. A severe hailstorm occurred in Chicago and vicinity on the 21st. This storm was unusual both in duration—lasting five minutes—and in the size of the hailstones, some of the stones measuring an inch in diameter, with jagged points.—*F. J. Walz, Inspector, Weather Bureau.*

#### SAN FRANCISCO FORECAST DISTRICT.

The month as a whole has been an uneventful one. Cooler weather than usual prevailed throughout California, permitting fruit to ripen slowly. From July 12 to 17 and again from the 20th to 24th generous rains and frequent thunderstorms occurred from the Valley of the Colorado eastward. Warnings of warmer weather with high north winds were issued for northern California on July 2, and were verified.—*A. G. McAdie, Professor of Meteorology.*

#### PORTLAND, OREG., FORECAST DISTRICT.

The first decade of the month in this district was unsettled and showery, and the month, as a whole, averaged from 1° to 3° cooler than usual. A light frost occurred in southwestern Idaho on the morning of the 3d, for which warnings were issued twenty-four hours in advance.

The Columbia River slowly fell during the entire month, and at Portland, Oreg., the river passed below the danger mark during the afternoon of the 14th. It was forty-one days above danger line, during fifteen days of which time it was rising; on two days it was stationary, and during the remainder of the period it was falling.—*E. A. Beals, District Forecaster.*

#### DENVER FORECAST DISTRICT.

No special warnings were issued. The feature of the month was the exceptionally cool weather that prevailed following the passage of a low barometer area that developed in the middle Rocky Mountain region during the afternoon of July 1. During the 3d the fall in temperature was sharp, with a general and killing frost in high agriculture districts, and light local

frosts at moderate elevations on the 3d and 4th. Cooler weather was forecast for almost the entire district on the mornings of the 2d and 3d.—*F. H. Brandenburg, District Forecaster.*

#### AREAS OF HIGH AND LOW PRESSURE.

*Movements of centers of areas of high and low pressure.*

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
<b>High areas.</b>										
I.....	1, a. m.	41	124	3, a. m.	47	122	525	2.0	262	10.9
II.....	3, p. m.	49	86	6, a. m.	32	65	1,675	2.5	670	28.0
III.....	3, p. m.	47	112	10, a. m.	27	80	3,800	6.5	585	24.4
IV.....	6, p. m.	41	124	8, a. m.	45	100	1,375	1.5	917	38.2
V.....	8, p. m.	45	123	18, a. m.	32	65	4,150	9.5	437	18.2
VI.....	16, a. m.	53	121	21, p. m.	37	81	3,600	5.5	654	27.2
VII.....	22, a. m.	47	92	25, p. m.	38	80	1,400	3.5	400	16.7
VIII.....	24, p. m.	53	105	28, a. m.	39	75	2,000	3.5	571	23.8
IX.....	28, a. m.	48	117	4, a. m.*	45	64	3,575	7.0	511	21.3
Sums.....							22,100	41.5	5,007	208.7
Mean of 9 paths.....							2,456		556	23.2
Mean of 41.5 days.....									532	22.2
<b>Low areas.</b>										
I.....	29, p. m.†	38	105	2, p. m.	46	60	2,475	3.0	825	34.4
II.....	30, p. m.†	50	120	3, p. m.	50	100	2,225	3.0	742	30.9
III.....	2, p. m.	35	112	6, a. m.	44	70	2,550	3.5	728	30.3
IV.....	4, p. m.	44	116	8, a. m.	48	89	1,750	3.5	500	20.0
V.....	15, a. m.	35	112	19, a. m.	41	70	2,500	4.0	625	26.8
VI.....	21, a. m.	48	89	24, a. m.	46	60	1,700	3.0	567	23.6
VII.....	25, p. m.	44	116	30, p. m.	48	68	2,750	5.0	550	22.9
Sums.....							15,950	25.0	4,537	188.9
Mean of 7 paths.....							2,278		648	27.0
Mean of 25.0 days.....									638	26.6

\* August. † June.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*George E. Hunt, Chief Clerk, Forecast Division.*

#### RIVERS AND FLOODS.

Nothing of special interest transpired in the various river districts during the month. As a rule the stages were lower than during the preceding month. In the interior districts, however, they were higher than the usual summer stages, as a result both of the substantial rainfall and of the fact that the flood waters of May and June had not entirely passed out.

In the upper Red River there was a period of comparatively high water from the 4th to the 7th, with danger line stages at Arthur City, Tex., and Fulton, Ark. Warnings that were telegraphed on the morning of the 4th to all available points within the State of Arkansas were well verified by the subsequent events. Some losses to crops were reported, amounting to perhaps \$15,000 or \$20,000, while the value of property saved by removal or protection was, according to advices received, about \$200,000.

Heavy local showers over Texas during the first few days of the month also caused a sharp rise in the Trinity River. At Dallas, Tex., the water rose from 7.9 feet on the 2d to 32.7 feet on the 6th, the latter stage being 7.7 feet above the danger line. At points below the rise was not so marked. Warnings were distributed on the morning of the 4th, but four days after the establishment of the service on Trinity River. This new service is a part of the extensive additions that were made to the Texas River and Flood Service on July 1, 1903. Heretofore, service had been maintained only on the Brazos River, but on July 1 new river stations were established as follows: On the Sabine River, at Logansport, La., and Orange, Tex.; on the Neches River, at Rockland and Beaumont, Tex.; on the Trinity River, at Dallas, Riverside, and Liberty, Tex., and on the Colorado River, at Ballinger, Austin, and Colum-

bus, Tex. An additional station was also located on the Brazos River, at Hempstead, Tex.

Traffic was uninterrupted on the navigable rivers, except the upper Tennessee, where low water necessitated a suspension of navigation on the 25th.

The highest and lowest water, mean stage, and monthly range at 175 river stations are given in Table VII. Hydro-

graphs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, District Forecaster.*

## CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions during July are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

**Alabama.**—While the rainfall was deficient over most of the State enough was received to favor growth and final cultivation of crops. Cotton, though comparatively small, made good growth and was fruiting well; bolls were maturing and some opening in southern counties at close of the month. Early and late corn were in good condition, promising an unusually good yield. Minor crops did well and much hay was saved in excellent condition. Fodder pulling was in general progress.—*Thomas Crawford.*

**Arizona.**—The weather during July was moderately warm, with considerable cloudiness and frequent showers from the middle of the first decade to the middle of the third decade. The dry weather during the latter half of June and the early part of July began to have an injurious effect upon vegetation, but the showers later in July revived crops and ranges so that they were generally in good condition throughout the rest of the month.—*M. E. Blystone.*

**Arkansas.**—The temperature was seasonal, with a slight excess of rainfall. Cotton, while small, made rapid growth, and the bulk of the crop was laid by in fair to good condition. A good crop of early corn was assured; the late was promising, but in some limited sections it suffered from lack of moisture. The thrashing of wheat and oats was well advanced, the yield being light and quality good. Considerable hay of excellent grade was secured. Gardens, pastures, and forage crops were in fine condition; no improvement in apples and peaches.—*Edward B. Richards.*

**California.**—Extremely hot weather on the 2d and 3d caused but little damage to deciduous fruits, and was followed by abnormally cool weather most of the month. High winds slightly damaged grain, considerable of which, and also of pasturage and timber were destroyed by fire. Grain harvest was nearly completed in some sections at close of the month. Wheat, oats, and barley were fair crops in the central and northern districts and unusually heavy in southern California. Deciduous fruits were yielding heavily.—*Alexander G. McAdie.*

**Colorado.**—The weather conditions were favorable. While precipitation was somewhat below normal, irrigation water was generally sufficient. The harvest of winter wheat and rye advanced favorably, and much spring wheat, oats, and barley was ready to harvest at the close of the month. Corn, potatoes, beets, gardens, and fruits did well. Much native hay was cut and stacked in prime condition, and cutting of the second crop of alfalfa was well under way during the last decade. The ranges afforded excellent pasturage.—*F. H. Brandenburg.*

**Florida.**—The month was slightly cooler than the normal, with an excess of more than an inch of rainfall, the latter being fairly well distributed over northern, western, and central counties and over the western portion of the southern district. The rainfall, both in amount and distribution, was generally unsatisfactory in Atlantic coast counties. Cotton made fair progress, though several weeks late; it fruited slowly, but made good stalk. The corn crop promised to be the best for several years; it was laid by mostly during last week of month. Cane, cassava, peas, and minor crops did well. Citrus fruits made good progress, though rainfall was less than the requirements. Many pineapple slips were set out.—*A. J. Mitchell.*

**Georgia.**—Rainfall well distributed, but below the average. General conditions most favorable to all farming interests and crops improved materially during the month. Cotton made rapid growth and at the close of the month was healthy and taking on squares and blooms in the northern section, and fruiting in middle and southern divisions, comparatively little shedding being reported. Cane, peas, potatoes, and minor crops made satisfactory progress, the indications being favorable for large yields.—*J. B. Marbury.*

**Idaho.**—Weather generally favorable for farming operations, with abundant water for irrigation in most canals until near close of the month, when shortage of water began to cause anxiety in localities. Fruit advanced rapidly, early varieties being abundant and in market. The yield of hay was good. Sugar beets made satisfactory growth.—*S. M. Blandford.*

**Illinois.**—The first half of the month was warm and vegetation was greatly stimulated; the latter part was mostly too cool for normal growth. The rainfall was not well distributed, and periods of drought were experienced. Corn made fair advance, but at the end of the month it was estimated to be from two to three weeks backward, and very uneven. A large crop of hay of fine quality was secured. The harvesting of oats was progressing and some thrashing done, the yield being generally below the average. The outlook for apples was not promising.—*Wm. G. Burns.*

**Indiana.**—In south section cutting of wheat and oats was practically completed during first half of July, and the bulk of these crops was thrashed before close of month, the yields being fair to very light; in central and north sections cutting and thrashing continued under favorable conditions, with better but not satisfying results, some fields yielding fair to good and others about half crop. An unusually heavy crop of hay was secured, mostly in excellent condition. Corn made normal growth, but was very uneven, much being from one to three weeks late.—*W. T. Blythe.*

**Iowa.**—The month was slightly cooler than usual, with sudden alternations in temperature. Rainfall was excessive in northern section and deficient in southern. General conditions were quite favorable for hay-making and harvesting wheat, oats, rye, and barley. A large crop of hay was secured in best condition. Grain crops were affected by blight and rust and yields lighter than usual, but grain in better condition than last year. Corn late, but made fairly good progress. Potatoes and minor crops did well.—*John R. Sage.*

**Kansas.**—Harvesting of wheat, oats, and barley finished, wheat being much better in the west than in the east; oat yield was lighter than expected, but the yield of barley was good. Early corn tasseled, silked, and eared well, and late corn made good growth. Second crop of alfalfa stacked, third crop doing well; prairie hay good. Early apples ripe and abundant in south.—*T. B. Jennings.*

**Kentucky.**—Rainfall was unevenly distributed. Drought damaged crops considerably in eastern and some central counties. Cool weather from the 12th to 22d retarded growth of corn and tobacco. General rains about the close of the month greatly improved crops. Corn and tobacco in the western and southern counties were very promising, but they were backward in northern and eastern counties. The yield of wheat was very poor; that of oats and hay was good.—*S. P. Gresham.*

**Louisiana.**—Warm, showery weather during the first half of the month caused cotton to grow rapidly, but the showers were so frequent as to prevent cultivation, and the crop suffered some injury from grass, especially on lowland. More favorable conditions prevailed during the latter half of the month and the bulk of the cotton crop was laid by, generally free from weeds and grass, but from two to four weeks late. Sugar cane made vigorous and healthy growth. Rice was promising and harvest commenced in a few parishes. Conditions were generally favorable for the corn crop.—*I. M. Cline.*

**Maryland and Delaware.**—Prevailing wet weather interfered somewhat with harvest and several cool spells checked growth, especially of corn. Wheat gave light yields of inferior grade, and rye, barley, and oats were generally short. Timothy improved decidedly, however, and gave fair to good yields. Cornfields were grassy and the crop rather backward. Tobacco was small but healthy and topping had begun. Apples continued promising, and truck, with the exception of melons and cantaloupes, yielded satisfactorily.—*Oliver L. Fussig.*

**Michigan.**—The month was generally favorable for crop growth and harvest work, but the last half was too cool for best growth of corn. Hay, wheat, rye, and barley were generally well secured. Sugar beets, oats, peas, potatoes and beans made good progress and apple prospects continued promising.—*C. F. Schneider.*

**Minnesota.**—Crops in north revived by rains of 1st to 4th and locally benefited by rains of 9th; rains of 27th were too late for early crops; elsewhere too much rain flooded lowlands and caused rank growth of spring wheat, oats, and barley, with lodging and tendency to rust. Local wind, rain, and hail storms on the 7th, 9th, 16th, 20th, and 27th, with aggregate loss exceeding a million dollars. About the 15th rye and early barley were being cut and early oats and winter wheat ripening. On the 31st all the rye and most of the barley and winter wheat were cut, while spring wheat and early flax were ripening rapidly in south half of the State. Corn growth was retarded by wet and cool soil. The hay crop was light in north and abundant in south. The flax crop was good in many places.—*T. S. Outram.*